भारतीय मानक
Indian Standard

IS 17730 (Part 2) : 2021

कृषि वस्त्रादि — कृषि और बागवानी अनुप्रयोगों के लिए ओला संरक्षण जाल — विशिष्टि

भाग 2 बुने हुए ओला संरक्षण जाल

Agro Textiles — Hail Protection Nets for Agriculture and Horticulture Purposes — Specification

Part 2 Woven Hail Protection Nets

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Technical Textiles for Agro-tech Sectional Committee, TXD 35

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards, after the draft finalized by the Technical Textiles for Agro-tech Sectional Committee had been approved by the Textiles Division Council.

Hail protection nets are used to avoid the damage caused to flowers or fruits from hails (seasonal or unseasonal) especially in hilly areas. These also helps in minimizing the flower drop/fruit drop due to hails. Hail protection nets can be manufactured from weaving technique as well as warp knitting technique, maintaining the optimum shading percentage and porosity to dampen the impact of heavily falling hails.

This Indian Standard is published in two parts. The other part in this series is:

Part 1 Warp knitted hail protection nets

Installation guidelines for hail protection net are given in Annex F for guidance only.

The composition of the Committee responsible for the formulation of this standard is given in Annex G.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AGRO-TEXTILES — HAIL PROTECTION NETS FOR AGRICULTURE AND HORTICULTURE PURPOSES — SPECIFICATION

PART 2 WOVEN HAIL PROTECTION NETS

1 SCOPE

This standard (Part 2) prescribes constructional and other performance requirements for woven hail protection nets manufactured from mono filament yarns for agriculture and horticulture purposes to avoid fruit or flower drop/damage.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 16366 shall apply.

4 MATERIALS

4.1 HDPE Monofilament

Monofilament yarn shall be manufactured from HDPE granules, which shall be UV stabilized by adding suitable UV stabilizer. The linear density of the monofilament yarn shall be 61.11 tex (550 denier) or 72.22 tex (650 denier). As agreed to between the buyer and the seller, coloured monofilament yarn shall be manufactured using colour master batch. The denier of HDPE monofilament yarn used in the manufacture of woven hail protection nets shall be subjected to the following tolerances:

a) ± 10 percent on individual value; and
b) ± 5 percent on average.

4.1.1 The heat shrinkage of the monofilament yarn at 60 °C shall not exceed 5 percent when subjected to the specified temperature for a period of 10 min in an air circulating oven. The heat shrinkage of the monofilament yarn at 95 °C shall not exceed 8 percent when subjected to the specified temperature for a period of 10 min in hot water bath.

5 TYPES

Based on the mass in g/m^2, the woven hail protection nets are classified as follows:

a) *Type I* — Having mass of 60 g/m^2; and
b) *Type II* — Having mass of 70 g/m^2.

6 MANUFACTURE

6.1 Fabric

The fabric used in the manufacture of woven hail protection nets shall be woven with leno weave and shall have a minimum width of 3.0 m. A tape of 1.70 ± 0.2 mm width or monofilament yarn of suitable diameter having the name of the manufacture and mass (g/m^2) shall be provided at one end of the fabric which shall run through the complete length of the roll for identification of manufacture.

NOTES

1 For identification of manufacture, the name of the manufacture and GSM may also be provided at either selvedge of the fabric.

2 Any other form of identification other than inserting the tape or monofilament yarn may also be provided at either selvedge of the fabric which shall run throughout the length of the fabric.

6.1.1 The fabric shall have tucked in type selvages and width of selvages shall be minimum 20 mm.

6.2 Reinforcement

A reinforcement of 10 ± 0.5 cm shall be provided at both the selvedge ends for all widths of hail protection nets. A reinforcement of 30 ± 1 cm shall also be provided at the centre of woven hail protection nets of width more than 6 m.

NOTE — If agreed to between the buyer and seller, a reinforcement of 30 ± 1 cm may also be provided at the centre of the woven hail protection nets of width less than 6 m.

6.3 Joints

There shall be no joint in woven hail protection nets of width less than 4 m. For hail protection nets of width more than 4 m, maximum of two joints are permitted. A panel of width less than 3 m may also be permitted to get the desired finished net width.

6.4 Stitching

The yarn used for stitching shall be high tenacity polyester or high tenacity nylon or high tenacity UV stabilized polypropylene multifilament. Stitching shall be done by using 2 or more threads in double chain lock or overlock or interlock machine.

6.5 Colour

The colour or a mixture of colour of the woven hail protection nets fabric shall be as per the agreement between the buyer and the seller. The colour/shade shall be as specified in the contract or order. In case a sample has been agreed upon and sealed, the supply shall be made in conformity with the sample in such respect (*see* Note).

NOTE — In most of the cases, the woven hail protection nets are white or transparent in colour. These may also be supplied in other colours as agreed to between the buyer and seller.

7 REQUIREMENTS

7.1 Dimensions

The woven hail protection nets shall be made to the shade and dimensions as specified in the contract or order. The dimensions shall be determined by the method prescribed in IS 1954. The following tolerance shall be permissible for length and width:

Dimension	*Tolerance*, Percent
Length	+3 –0
Width	+3 –0

7.2 The woven hail protection net fabric shall conform to the requirements specified in Table 1.

8 PACKING AND MARKING

8.1 Packing

The woven hail protection nets shall be packed in roll form in length of 50 m or in bundle form or as agreed to between the buyer and the seller.

8.2 Marking

Each fabric roll/bundle shall be marked legibly by affixing a label with the following information:

a) Name of the manufacturer or trade mark;
b) Manufacturing technique of hail protection net, that is woven;
c) Length and width of the woven hail protection nets;
d) Type and mass per square meter;
e) Batch number or Lot number; and
f) Any other information as required by the buyer or the law in force.

8.3 BIS Certification Marking

The woven hail protection net rolls/bundles conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the woven hail protection net rolls/bundles may be marked with the Standard Mark.

Table 1 Requirements of Woven Hail protection Nets

(*Clause* 7.2)

Sl No.	Characteristic(s)	Requirement(s)		Method of Test, Ref to
		Type 1	*Type 2*	
(1)	(2)	(3)	(4)	(5)
(i)	Mass in g/m^2, (with a tolerance of ± 5 percent)	60	70	IS 1964
(ii)	Average breaking strength of woven hail protection fabric (Strip method, 325 × 50 mm test piece with gauge length of 200 mm), N, *Min*;			IS 1969 (Part 1)
	a) Warpway	450	450	
	b) Weftway	280	300	
iii)	Retention of breaking strength after UV exposure of 144 hours, percent, *Min*	85 percent of original actual value (fabric)		Annex B and IS 1969 (Part 1)
iv)	Colour fastness to artificial light[1)]	← 5 or better →		IS 105-B02
v)	Bursting pressure, kgf/cm^2, *Min*	10	12	IS 1966 (Part 1) or IS 1966 (Part 2)
vi)	Shading percentage, percent, *Max*	17	17	Annex C
vii)	Porosity, percent	80 ± 5	80 ± 5	Annex D
viii)	Cold cracking resistance test at –10 °C	No specimen shall damage or broken		Annex E
ix)	Seam (joint) strength, percent, *Min*	85 percent of the original average breaking strength of the fabric		IS/ISO 13935-1

[1)] Applicable for coloured hail protection nets only

9 SAMPLING

9.1 Lot

All woven hail protection nets rolls/bundles of same construction and type dispatched to a buyer against one dispatch note shall constitute a lot.

9.2 Unless otherwise agreed to between the buyer and the seller, the number of woven hail protection nets rolls/bundles to be selected at random from a lot shall be as given in column 3 of Table 2.

10 NUMBER OF TEST SPECIMENS AND CRITERIA FOR CONFORMITY

Number of test specimens and criteria for conformity shall be as given in Table 3.

Table 2 Scale of Sampling

(*Clause* 9.2)

Sl No. (1)	No. of Rolls/Bundles in Lot (2)	Sample Size (3)	Sub-Sample Size (4)	Permissible No. of Defective Rolls/Bundles (5)
i)	Up to 50	3	2	0
ii)	51 - 150	5	2	0
iii)	151 - 300	8	3	1
iv)	301 - 500	13	5	2
v)	501 and above	20	5	3

Table 3 Number of Test Specimens and Criteria for Conformity

(*Clause* 10)

Sl No. (1)	Characteristic (2)	No. of Rolls/Bundles (3)	Criteria for Conformity (4)
i)	Material, manufacture, dimensions and mass	According to column 3 of Table 2	The defective rolls shall not exceed the corresponding number given in column 5 of Table 2
ii)	All other requirements	According to column 4 of Table 2	All the test specimens shall pass the tests

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
105-B02 : 2014	Textiles — Tests for colour fastness: Part B02 Colour fastness to artificial light : Xenon arc fading lamp test
1954 : 1990	Determination of length and width of woven fabrics — Methods (*second revision*)
1964 : 2001	Textiles — Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*)
1966	Textiles — Bursting properties of fabrics — Determination of bursting strength and bursting distension
(Part 1) : 2009	Hydraulic method (*second revision*)
(Part 2) : 2009	Pneumatic method (*second revision*)
1969 (Part 1) : 2018	Textiles — Tensile properties of fabrics: Part 1 Determination of maximum force and elongation at maximum force using the strip method (*fourth revision*)
6359 : 1971	Method for conditioning of textiles
13935-1 : 2014	Textiles — Seam tensile properties of fabrics and made-up textile articles: Part 1 Determination of maximum force to seam rupture using the strip method (*first revision*)
16366 : 2015	Glossary of terms used in agrotextile

ANNEX B

[*Table* 1, *Sl No.* (iii)]

UV RESISTANCE TEST

B-1 TEST SPECIMENS

The test specimens for breaking strength shall be cut from the sample as specified in IS 1969 (Part 1).

B-2 TEST CONDITIONS

B-2.1 The test shall be carried out with fluorescent UV-B lamp (313 nanometer or its equivalent).

B-2.2 The duration of the test shall be 144 h (that is 6 days).

B-2.3 The test cycle shall be 8 h at 60 ± 3 °C with UV radiation alternating after 4 h at 50 ± 3 °C with condensation.

B-2.4 Irradiation level throughout the test shall be maintained at $0.63^{+0.03}_{-0.0}$ W/m².

B-3 TEST PROCEDURE

B-3.1 Determine the original average breaking strength of hail protection nets specimens separately as per the test specified in IS 1969 (Part 1).

B-3.2 Expose the specimens alternately to ultraviolet light alone and to condensation in one respective cycle.

B-3.2.1 The type of fluorescent UV lamp, the timing of the UV exposure and the temperature of condensation shall be as specified in **B-2**.

B-3.3 Determine the average breaking strength of the specimens separately after UV exposure as mentioned above.

B-3.4 Determine the percent retention of original strength as follows:

Percent retention of original breaking strength =

$$\frac{b}{a}\times 100$$

where

a = average breaking strength before UV exposure as obtained in **B-3.1**; and

b = average breaking strength after UV exposure as obtained in **B-3.3**.

NOTES

1 The UV source is an array of fluorescent lamps (with lamp emission concentrated in the UV range).

2 Condensation is produced by exposing the test surface to a heated, saturated mixture of air and water vapour, while the reverse side of the test specimen is exposed to the cooling influence of ambient room air.

ANNEX C

[*Table* 1, *Sl No.* (vi)]

TEST METHOD FOR DETERMINING SHADING PERCENTAGE OF HAIL PROTECTION NETS

C-1 PRINCIPLE

A sample of the hail protection nets is mounted in shade-O- meter tester and the amount of light transmitted or passed through the sample is measured with the help of photosynthetically active radiations (PAR) sensor, in W/m^2. The relative measurement of light transmission with and without sample is considered for calculating the shading percentage of hail protection nets.

C-2 SAMPLING

C-2.1 Laboratory Sample

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll/bundle so that the requirements of **C-2.2** can be met.

C-2.2 Test Specimens

From the laboratory sample, cut at least 10 samples each having dimensions of 180 × 180 mm. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvage or edge of the hail protection nets. The selected test specimens shall not have any creases or folds.

C-3 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing hail protection nets (65 ± 5 percent relative humidity and 27 ± 2 °C temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

C-4 APPARATUS

The instrument used for measurement shall meet the geometric and spectral requirements. The schematic diagram of the apparatus is given in Fig. 1.

NOTE — The Shade-O-meter has been designed and developed by The Synthetic & Art Silk Mills Research Association, Mumbai. This information is given for the convenience of users of this Indian Standard and does not constitute an endorsement by BIS for this equipment.

C-4.1 The shade-O-meter tester shall have a flat base with total approximate dimensions as given below:

Length × Diameter × Height = 970 × 350 × 325 mm

C-4.2 Apparatus shall consist of a chamber in which arrangement for placement of light source, filters, sample holder and sensor shall be provided. The inside surface of chamber shall be painted with black paint and shall be highly reflecting throughout the visible spectrum. The light transmitted through the hail protection nets sample shall be measured by light sensors.

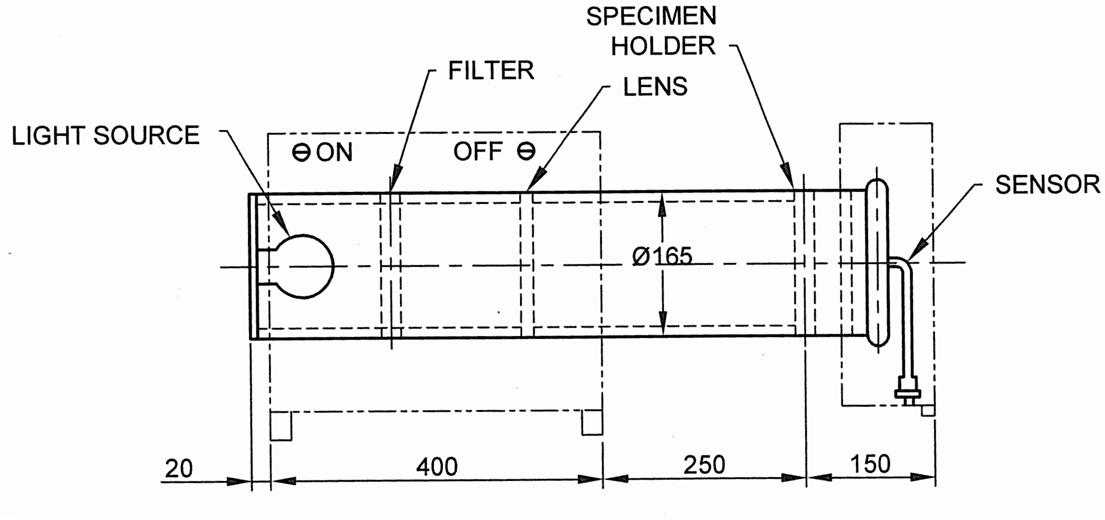

Fig. 1 Schematic Diagram of Shade-O-Meter

C-4.3 The apparatus shall consist of the following elements:

a) *Light source* — Tungsten lamp which is an incandescent light bulb that has a tungsten filament shall be used in the apparatus to cater to visible light spectrum range. The light bulb of 60 W shall be used in the equipment.

b) *Filter* — Neutral density filters (ND) which exhibit nearly constant transmission, especially in the visible range shall be used in the apparatus. The filter shall be of 165 × 165 ± 2 mm size. The thickness of filters shall be 1 mm. The transmission of the filter shall be in the range of 400 to 700 nanometer wavelength.

c) *Specimen holder* — The specimen holder shall be 180 × 180 mm size with a tolerance of ± 2 mm with sample clamping holder on both the sides. Specimen holders shall be made of aluminium or stainless steel. The profile of sample holder shall be such that after mounting the specimen, exposed area of specimen shall be of diameter 150 mm with a tolerance of ± 2 mm.

d) *Measuring sensor* — Pyarnometer type light sensors which provide accurate, continuous measurement of PAR in the visible spectrum range of 400-700 nanometer wavelength shall be used in the apparatus. The amount of light transmitted through the sample is measured with these sensors.

NOTE — The PAR quantum sensors from *M/s Kipp and Zonen* (mention of the name of specific instrument is not intended to promote or give preference to the use of that instrument over others not mentioned) may be used in this kind of measurement.

C-5 TEST PROCEDURE

C-5.1 Instrument shall be switched on and the reading for PAR without sample shall be taken on the sensor. This shall be recorded as T_1.

C-5.2 Hail protection nets sample (*see* **C-2.2**) shall be mounted in the slot of specimen holder. The reading of PAR measurement with sample shall be taken from the sensor. This shall be recorded as T_2.

NOTE — Test specimen shall be properly mounted in the specimen holder so that it shall not be very tight or very lose in the specimen holder.

C-5 CALCULATION

C-5.1 Shading percentage shall be calculated from the following formula:

$$\text{Shading percentage} = \frac{T_1 - T_2}{T_1} \times 100$$

where

T_1 = reading of transmitted light, in w/m^2 (without sample); and

T_2 = reading of transmitted light, in w/m^2 (with sample).

C-5.2 Calculate the arithmetic mean of the measured values of shading percentage for ten samples.

ANNEX D

[*Table* 2, *Sl No*. (vii)]

D-1 DETERMINATION OF POROSITY OF HAIL PROTECTION NETS

This method prescribes determination of porosity of hail protection nets.

D-2 APPRATUS

D-2.1 Thread Counter — A thread counter, equipped with a low power microscope of suitable magnification and a pointer which traverses along a graduated base. In the absence of such a thread counter, an ordinary counting glass with an aperture of 50 mm may be used.

D-2.2 Dial Thickness Gauge or Micrometer

D-2.3 Table — Having smooth flat surface of sufficient length and width to accommodate test specimen.

D-3 TEST SPECIMENS

D-3.1 Take 5 test specimens from each of the warp and the weft directions from the test pieces.

D-3.2 Specimens shall not contain dirt, irregular spots, creases, holes or other visible faults.

D-3.3 Any two specimens shall not contain the same warp or weft threads. Test specimen shall be taken at least 50 mm from the selvages.

D-4 CONDITIONING

D-4.1 Conditioning — Condition the test specimen at 27 ± 2 °C and 65 ± 5 percent relative humidity for not less than 24 h prior to test.

D-4.2 Test Conditions — Conduct test in the standard laboratory atmosphere of 27 ± 2 °C and 65 ± 5 percent relative humidity.

D-5 TEST PROCEDURE

D-5.1 Determination of Number of Warp and Weft Threads Per Inch or Mesh

Lay on a flat table a portion of one of the pieces constituting the test sample and smoothen it out. Place the counting glass with the pointer at zero on the piece in such a way that:

a) on turning the screw the pointer moves in a direction parallel or perpendicular to warp threads, depending upon which set of threads (warp or weft) is being counted, and

b) the pointer shall coincide either with the right hand or the left-hand edge of a thread, depending on whether the counting is started from right to left or from left to right direction. Find the number of warp or weft threads by counting the number of units comprising one thread and one space. Calculate the number of threads per inch in warp and weft direction. Take the average of five reading both in warp and weft direction.

NOTE — Pair of two warp threads used in leno weave shall be counted as two ends.

D-5.2 Measure the diameter of mono filament yarn by dial thickness gauge or micrometer in mm in yarn flattened state and convert it to inch. Take at least 10 number of readings each in warp and weft direction and calculate the average diameter in warp and weft direction.

D-6 CALCULATION

D-6.1 Determine the porosity by following formula:

$$\text{Porosity, percent} = [100\,(1 - EPI \times d_1) \times (1 - PPI \times d_2)] \times OL$$

where

EPI = ends per inch;

PPI = picks per inch;

d_1 = average diameter of the warp threads, in inches;

d_2 = average diameter of the weft threads, in inches; and

OL = multiplication factor for overlapping of warp and weft threads, taken as 1.03.

ANNEX E

[*Table* 1, *Sl No*. (viii)]

METHOD FOR DETERMINATION OF COLD-CRACK RESISTANCE TEST

E-1 PRINCIPLE

Specimens bowed in the shape of a loop are placed in a cooling chamber at –10 °C and subjected to sudden folding under the impact of a free-falling mass of 500 g. The test specimen shall not break or is damaged.

E-2 APPARATUS

The following description is an example of a typical test apparatus design (*see* Fig.2).

E-2.1 Impact Device, comprising the following elements.

E-2.1.1 *Specimen Holder*, permitting the fastening of one or more specimens on a platen by means of clamps (for example, leaf springs) to clench each specimen along its entire width (15 mm) and to secure 10 mm of each end of the loop (*see* Fig. 2) so that the length of the loop section subjected to folding is 40 mm. The platen may be equipped with a mechanism (revolving type) that allows each specimen to be placed successively in the test position under the guide tube which guides the impact mass.

E-2.1.2 *Rigid Anvil*, connected to, or part of, the specimen holder and on which the specimen is brought into the test position.

E-2.1.3 *Impact Mass*, 500 g, consisting of metal cylinders with a diameter of not less than 18 mm and not more than 29 mm, the edge of the lower face being slightly rounded.

E-2.1.4 *Guide Tube*, to guide the impact mass equipped at the upper end with a mechanism to release the mass (solenoid or mechanical trigger). This tube, approximately 250 mm long and with a diameter 1 mm larger than that of the impact mass, shall be placed vertically above the specimen test position and shall be mounted so that the drop height, that is the distance between the base of the impact mass and the anvil, is 200 ± 2 mm.

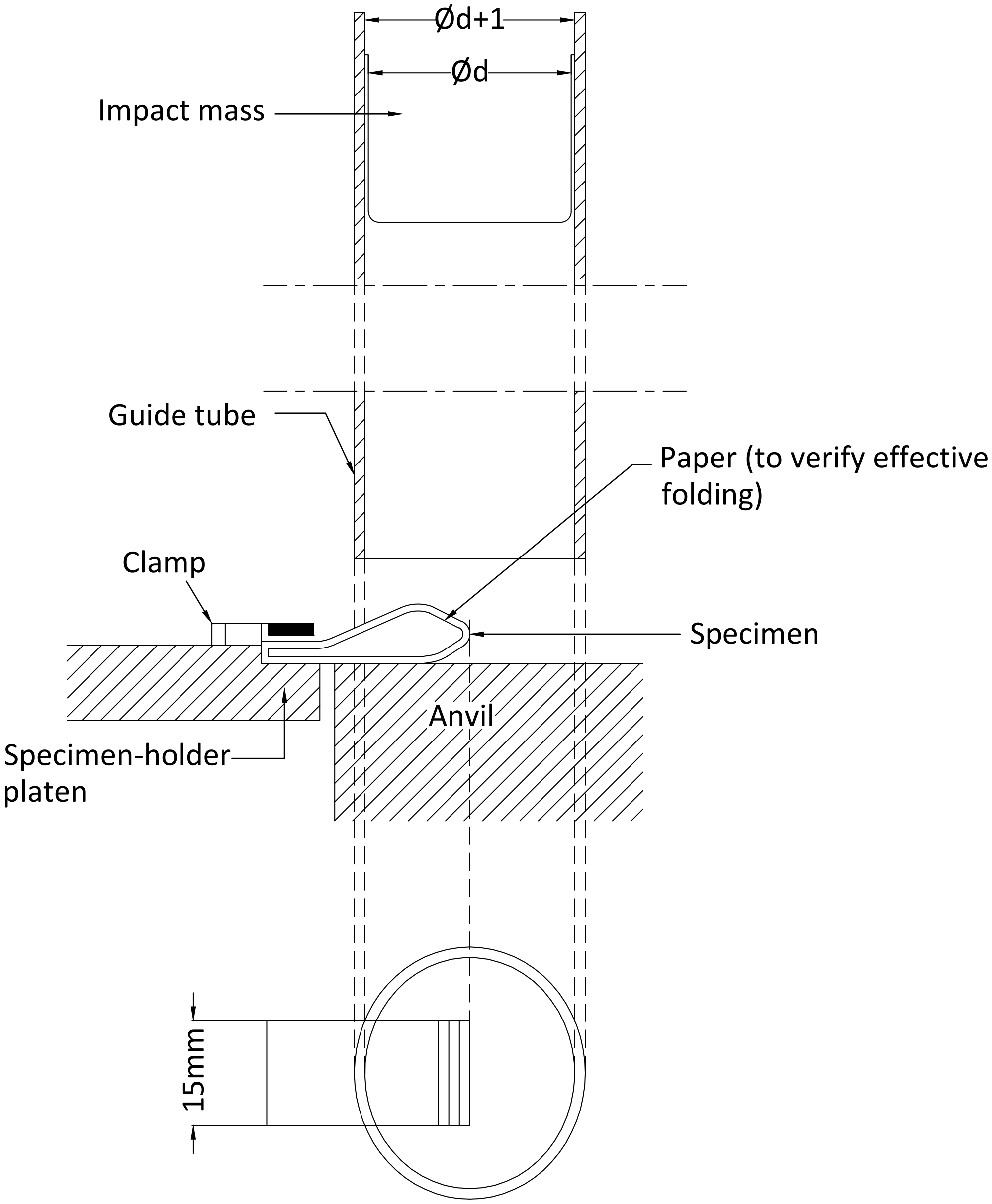

Fig. 2 Typical Impact Device for Determination of Cold Crack Resistance Test

E-2.1.5 *Holding Device*, to align the platen and the guide tube in such a position that the centre of the impact mass coincides with the edge of the flattened loop (20 mm from the clamp).

E-2.2 Cooling Chamber, to house the impact device allowing the temperature to be lowered in steps of 1 °C, and able to maintain a temperature constant to within ± 1 °C.

E-2.3 Thermometer, graduated in 0.5 °C, or thermocouple, with an accuracy of 0.5 °C, placed in the cooling chamber in the proximity of the specimens.

E-3 SPECIMENS

E-3.1 Shape and Dimensions

The specimens shall consist of strips measuring 60 mm × 15 mm. Their edges shall be free from cuts, scratches and other imperfections.

E-3.2 Number of Specimens

Five specimens shall be taken with their long axis (60 mm) parallel to the machine (that is longitudinal) direction, and 5 specimens with their long axis parallel to the transverse direction.

E-4 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

Condition the test specimens to moisture equilibrium from the dry side in the standard atmosphere of 65 ± 2 percent relative humidity and 27 ± 2 °C temperature (*see* also IS 6359). When the specimens have been left in such an atmosphere so that both the faces are exposed to the standard atmosphere as far as possible for 24 h, they shall be deemed to have reached the state of moisture equilibrium.

E-5 PROCEDURE

E-5.1 Verify the alignment of the guide tube with respect to the position of the specimen on the platen.

E-5.2 Place the impact device containing the mounted specimens in the cooling chamber. When the impact device has reached equilibrium at the test temperature of –10°C (approximately 15 min), position the specimen below the guide tube. Release the impact mass, then reset it to its initial position. Repeat the operation for the other specimens, if any. Take the platen out of the cooling chamber, remove the specimens and inspect them. A specimen is deemed to be damaged or broken, if any trace of breaking is visible to the naked eye. This trace can be a point or a line, while total rupture may occur, with or without splintering. A whitish line at the fold may occur with certain types of pigmented or unpigmented material, but this is not considered as a failure.

ANNEX F

(*Foreword*)

INSTALLATION GUIDELINES FOR HAIL PROTECTION NETS

F-1 Hail protection nets can be installed by two methods over the fruit trees that are single tree installation method or strip/trellis system.

F-1.1 Single Tree Installation Method

F-1.1.1 This method is employed for standard varieties of trees which are tall and grow up to a height of 25-30 feet with a width extending up to 15-18 feet and having a crop geometry of 10 m × 10 m. As the trees are huge they need to be managed individually for which, an individual or maximum of 2 trees are covered with hail protection net.

F-1.1.2 Bamboo or galvanized iron (GI) pipe shall be fixed at the centre of the trees or 1 m besides the tree in case net is to be installed over a single tree only.

F-1.1.3 The bamboo or GI pipe shall be at least one meter above the tip of the tree canopy.

F-1.1.4 In order to keep the net safe from tearing at contact point with bamboo/GI pipe, farmers shall tie piece of cloth or sack at the top of the bamboo.

F-1.1.5 As the net requires to be installed and removed every year before start of flowering and after fruit harvesting, skilled labour should be employed so that spurs should not get damage.

F-1.1.6 Typical photographic representations of the installation of hail protection nets by single tree method is shown in Fig. 3A, Fig. 3B and Fig. 3C.

F-1.2 Strip/Trellis Method

F-1.2.1 Spur type varieties of apple are gaining favour with the growers which can be grown as high density plantations. Under this, ultra high density plantations (1 m × 1 m) to high density plantations (3 m × 3 m) are being used. The height of the plants shall be kept at maximum of 2-3 m through different training and pruning methods. However, the life period of this orchard is not more than 10-12 years.

F-1.2.2 This installation system is employed over the trees having similar height, so as to have less canopy and hence installation become easier.

F-1.2.3 The structure of strip/trellis method shall be commissioned with the help of bamboos or galvanized iron (GI) pipes, depending upon the area of orchard to be covered.

F-1.2.4 As the life of bamboo is only 4-5 years, the structure may be made with GI pipe in order to achieve longer life span of the structure.

F-1.2.5 The hail protection net shall be installed over the structure suitably with proper tension to avoid dampness of the net during hailstorm.

F-1.2.6 Typical photographic representations of the installation of hail protection nets by strip/trellis method is shown in Fig. 4A and Fig. 4B.

F-2 PRECAUTIONS TO BE TAKEN DURING INSTALLATION OF HAIL PROTECTION NET

F-2.1 Hail protection net should not fray during cutting.

F-2.2 Installation of hail protection nets should be done in such a manner that it can withstand strong winds.

F-2.3 Installation of hail protection nets should be done in such a manner to ensure maximum penetration of sunlight.

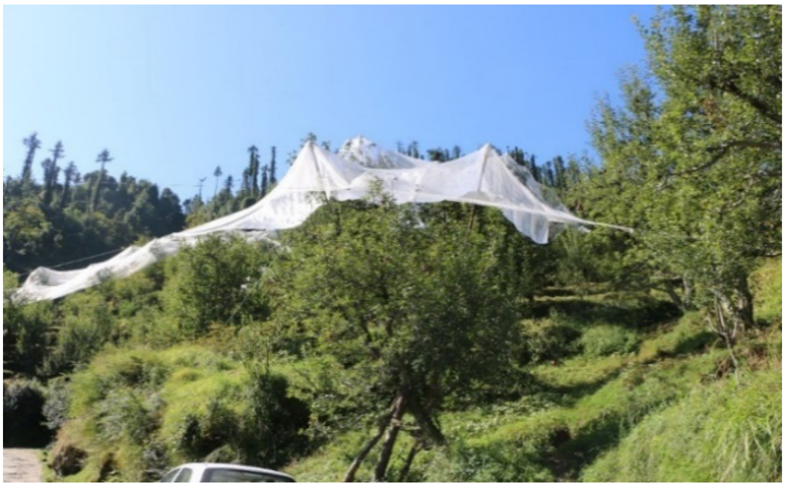

FIG. 3A

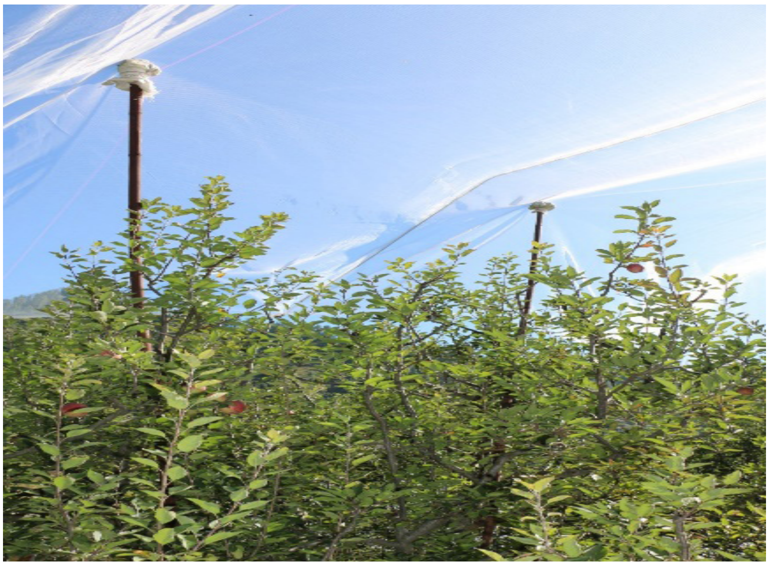

FIG. 3B

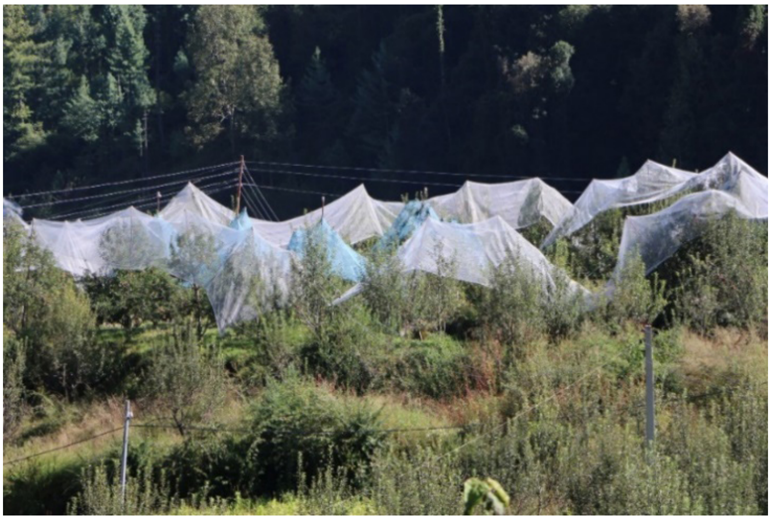

FIG 3C

FIG. 3 TYPICAL PHOTOGRAPHIC REPRESENTATION OF INSTALLATION OF HAIL PROTECTION NETS BY SINGLE TREE METHOD

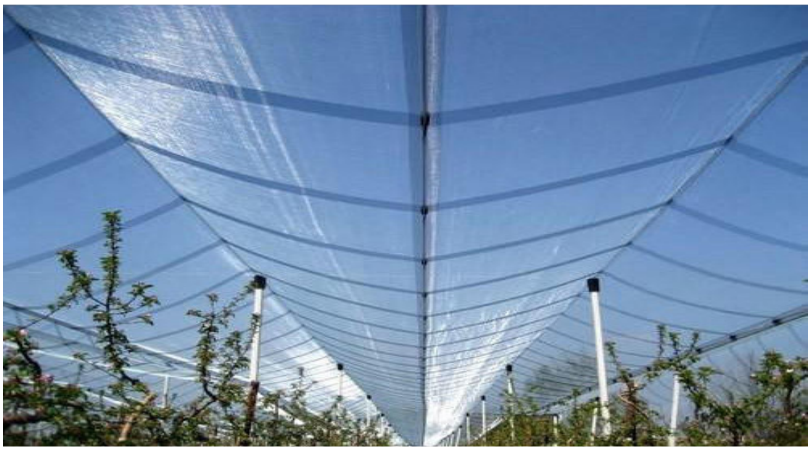

FIG. 4A

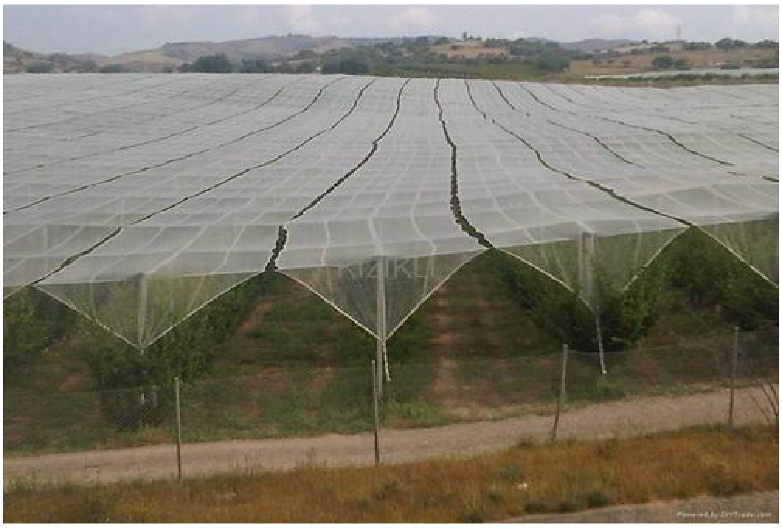

FIG. 4B

FIG. 4 TYPICAL PHOTOGRAPHIC REPRESENTATION OF INSTALLATION OF HAIL PROTECTION NETS BY STRIP/TRELLIS METHOD

ANNEX G

(*Foreword*)

COMMITTEE COMPOSITION

Technical Textiles for Agro-Tech Sectional Committee, TXD 35

Organization	*Representative(s)*
The Synthetic and Art Silk Mills Research Association, Mumbai	Dr U. K. Gangopadhyay (***Chairman***)
Central Agricultural University, Imphal	Shrimati Mamoni Probha Borah
Central Institute for Research on Cotton Technology, Mumbai	Dr N. Vigneshwaran Dr P. K. Mandhyan (*Alternate*)
Central Institute of Plastics Engineering and Technology (CIPET), Chennai	Dr Abdul Kader Shri Rajiv Kumar Lilhare (*Alternate*)
Central Silk Board, Bengaluru	Dr Subhash V. Naik Shri V. Ramesh (*Alternate*)
Chandra Shekhar Azad University of Agriculture and Technology, Kanpur	Dr Ashok Kumar Dr Jitendra Yadav (*Alternate*)
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Department of Jute and Fibre Technology, Kolkata	Dr Swapan Kumar Ghosh Prof A. K. Samanta (*Alternate*)
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FICCI, New Delhi	Shri Birju N. Bhojani Shri Vivek Prabhu (*Alternate*)
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ICAR-National Institute of Natural Fibre Engineering and Technology, Kolkata	Dr Surajit Sengupta Shri Manik Bhowmick (*Alternate*)
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Indian Institute of Packaging, Mumbai	Dr Tanweer Alam Shri Madhab Chakarvarty (*Alternate*)
Indian Jute Industries' Research Association, Kolkata	Dr Mahuya Ghosh Shri D. P. Gon (*Alternate*)
Indian Jute Mills Association, Kolkata	Shri Samir Kumar Chandra Shri J. K. Behara (*Alternate*)
Indian Technical Textile Association, Mumbai	Dr Anup Rakshit Shrimati Ruchita Gupta (*Alternate*)
Lamifab and Paper (P) Ltd, Aurangabad	Shri Kamleish Dhoot Shri Kishori Lal Dhoot (*Alternate*)
Maharashtra State Horticulture and Medicinal Plant Board, Pune	Director Project Manager (PC & FP) (*Alternate*)

Organization	*Representative(s)*
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Scientist ‘E’ (Textiles), BIS

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